

US & EU Experiences in Power Market Design

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Introduction



- **Overall objectives of market design for decarbonisation:**
 - to enable the transition to a low-carbon power system
 - at least cost,
 - While maintaining electricity security

Short-term markets can:

- be improved to facilitate the transition and integrate new resources (wind, PV, DR, batteries)
- ensure efficient and secure operations of increasingly complex power system
- provide an important feedback loop for investment decisions by revealing the value of electricity by time and location

What do we mean by “resolution”?



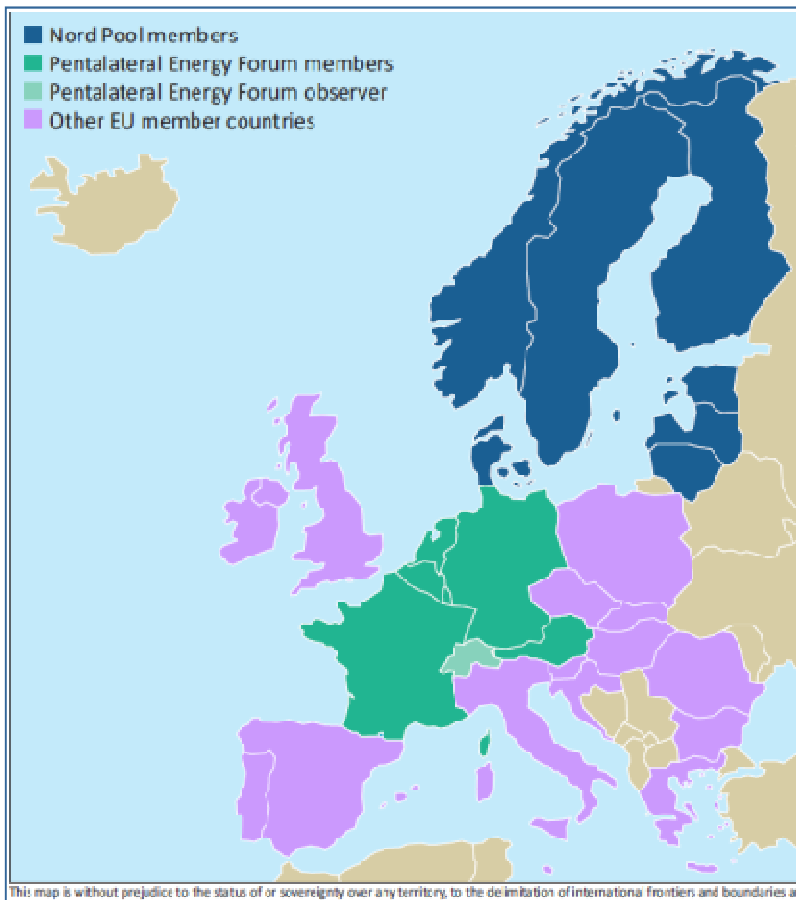
Market prices provide an “image” of system operations



	High resolution	Low resolution
Example of market	PJM	Germany
Power market platform	System operator	Power exchange
Bidding information	Unit/plant, complex bids	Portfolio, aggregated bid
Geographic resolution	Nodal	Single national price
Primary market	Real-time	Day-ahead
Real-time balancing prices	Single marginal price	Asymmetric prices
Dispatch interval	5 minutes	15 minutes or longer
Operating reserves	Co-optimised with energy	Separate markets

Short-term market prices can provide an economic representation of the physical reality of power system costs with a high temporal and geographical “resolution”

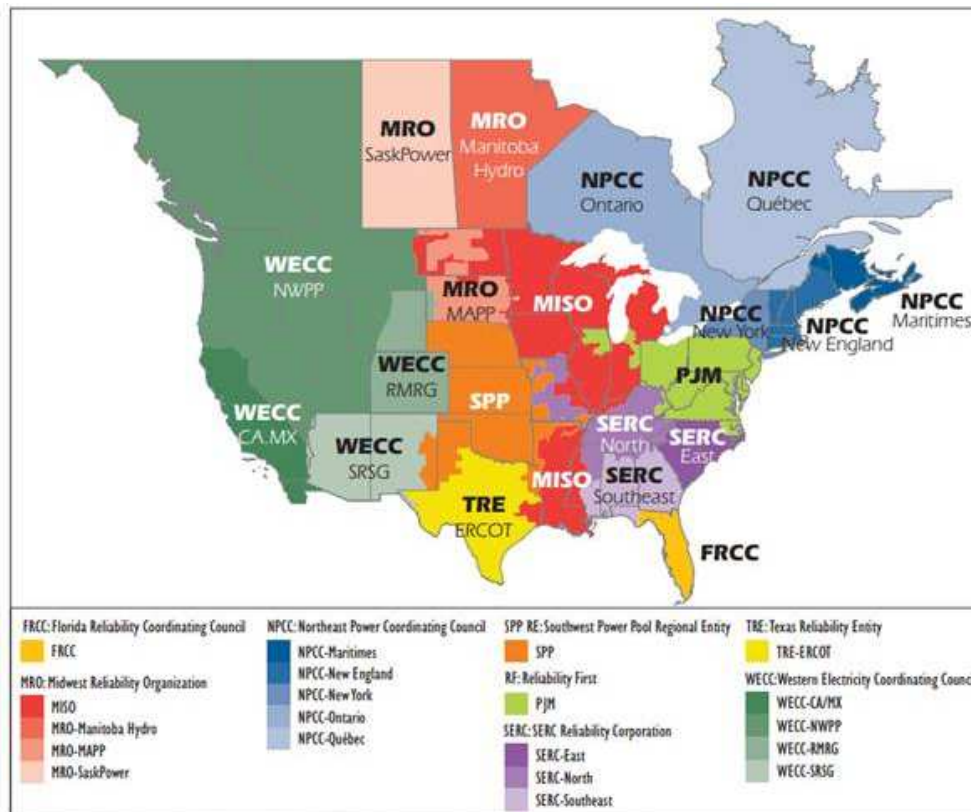
Market coupling: an achievement



- **Historically limited congestion**
- **Cross-border trade key to the IEM**
- **Decentralised PX**

⇒ *Low-resolution market designs have been flexible enough to expand to continental scale*

Many overlapping jurisdictions in the US



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Source: IEA, 2014d.

- Grid congestion
- Fragmentation of balancing areas
- Centralised ISO/RTO model

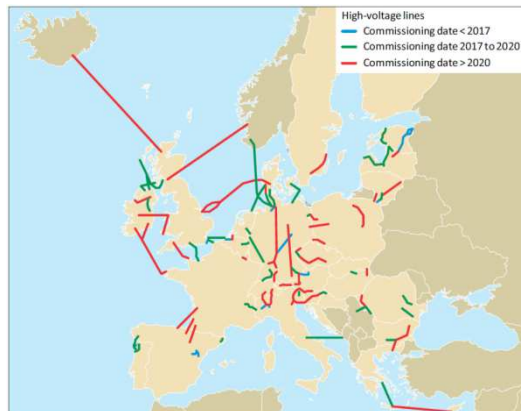
⇒ *High-res. market designs are sophisticated but difficult to integrate*

Will renewables increase congestion, calling for higher geographical resolution?



NO, congestion will remain limited

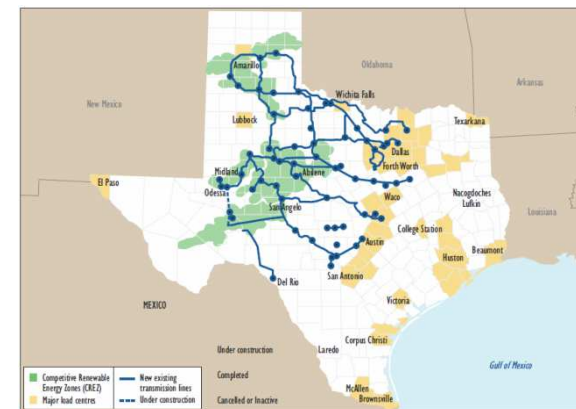
- Limited existing congestion
- Declining demand
- PCI
- Resource planning



⇒ *Europe invests in networks to ensure price convergence*

YES, congestion will increase

- Large renewable capacity
- Local acceptability issues
- Non-transmission options
- Curtailment

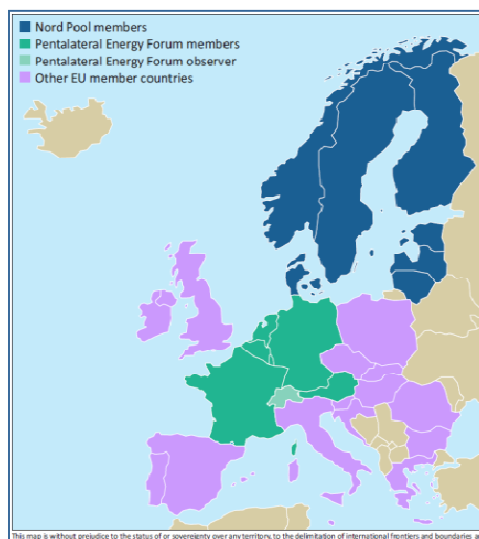


⇒ *ERCOT went nodal in 2010, even with grid investments*

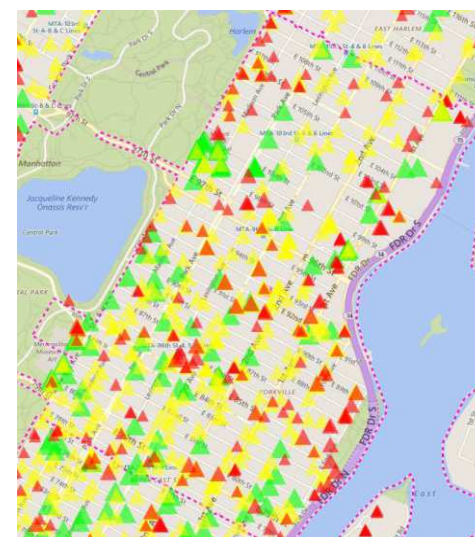
Increasing geographical resolution



Bidding zones



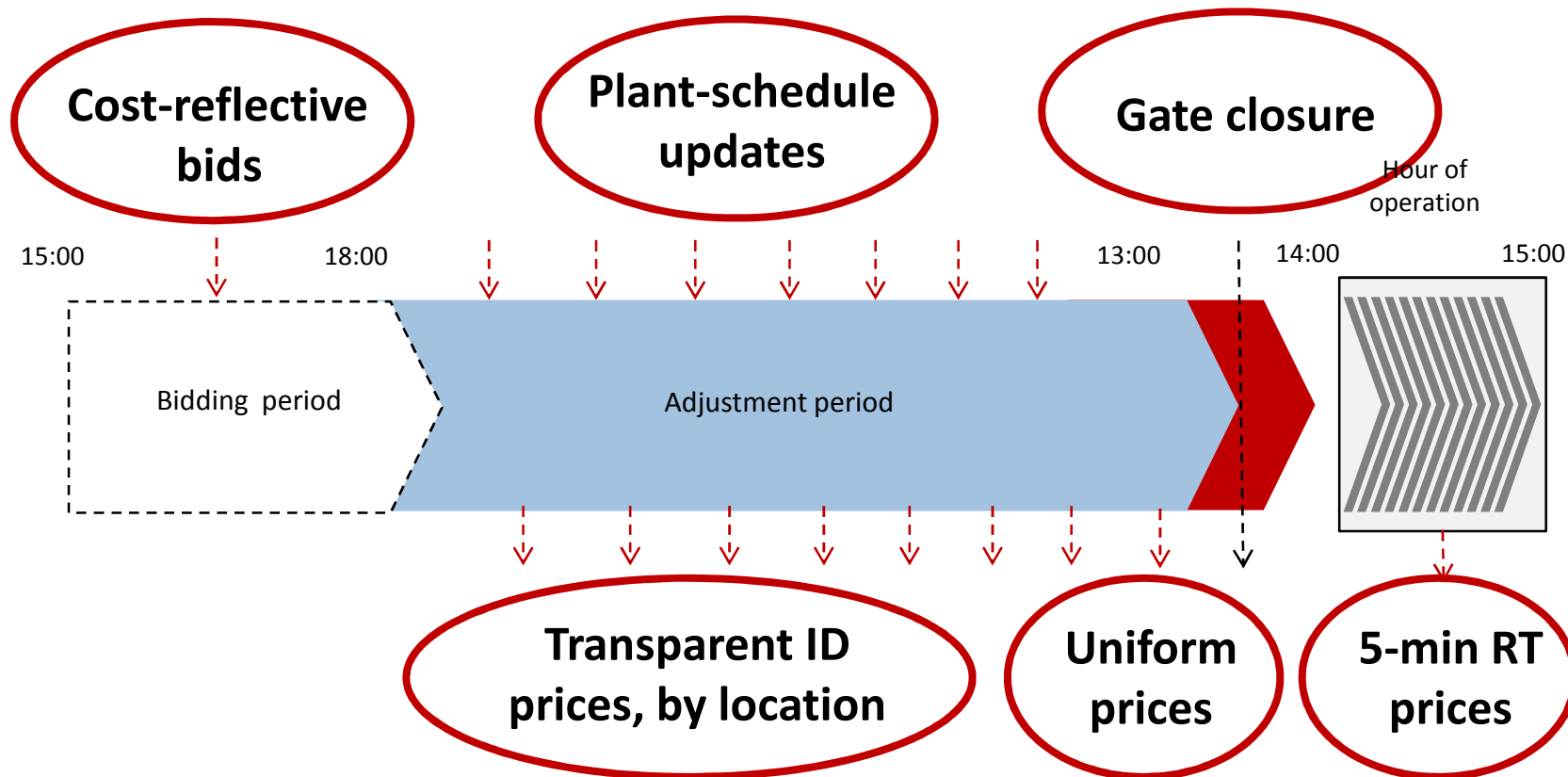
LMP + D



Source: ConEdison

⇒ Increasing geographical “resolution” is technically feasible and can provide signals for efficient integration of distributed resources

Increasing temporal resolution



⇒ *Transparent prices can inform all market participants, including distributed ones, about the evolution of electricity costs*

Electricity security remains regulated



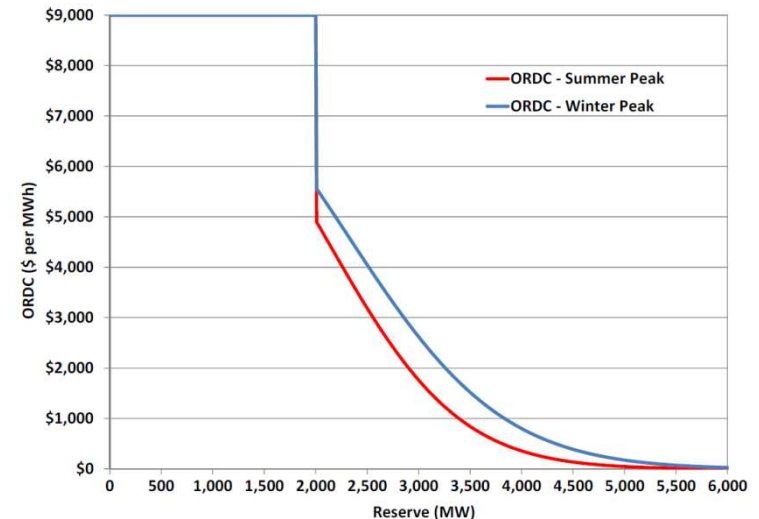
■ In theory, scarcity price can always clear the market:

- Demand response is improving
- Real time/ dynamic pricing should develop with smart meter deployment

■ In practice, reliability is regulated:

- Reliability standards
- Scarcity pricing not free from regulatory interventions:
 - Administrative shortage pricing (US)
 - Market Power mitigation (ex-ante rules)
- Capacity markets create a safety-net

ERCOT Operating Reserve Demand Curve



⇒ *Experience in existing markets suggests that regulators are likely to continue pricing reliability on behalf of consumers*

Conclusion: lessons learned from US and EU experiences



- Same laws of physics
 - Same granularity of information available to SOs
 - Same challenges of decarbonisation
 - Same distributed technologies available
 - Same objective of wind and solar integration
 - Same benefits for regional integration
- ⇒ Possible convergence EU /US based on best practices?
or past-decisions impossible to overcome

A game with a high geographical resolution



Or



Thank you

<http://www.iea.org/topics/electricity/publications/re-poweringmarkets/>